

CLAIMS

Claim 1. A robotic package unloading system for unloading uniform as well as non-uniform and non-structured bulk packages, comprising:

- a container for holding at least one package;
- a robotic manipulator,
 - wherein an end-of-arm tool is used to grip said package;
- a takeaway conveyor for moving said package,
- conveying means which is actively positioned to engage the package at one end and to be connected to said takeaway conveyor at second end;
- an image/sensor to identify and locate said package in said container; and
- a computer to control and process said robotic manipulator, said articulating belt and said image/sensor.

Claim 2. The robotic package loading system as described in claim 1, wherein said conveying means is an articulating belt

Claim 3. The robotic package unloading system as described in claim1 wherein said conveying means is a slide.

Claim 4. The robotic package unloading system as described in claim1, further comprising:

- a carriage for mounting said robotic manipulator;
- a carriage lift frame along which the carriage can move up and down; and
- a lift mechanism to position said carriage at a correct height for unloading said package.

Claim 5. The robotic package unloading system as described in claim 1, wherein said container is selected from the group consisting of a pallet, a bin and a case.

Claim 6. The robotic package unloading system as described in claim 1, wherein said package is selected from the group consisting of uniform and non-uniform and non-structured bulk.

Claim 7. The robotic package unloading system as described in claim 1, further comprising a safety enclosure to protect surrounding personnel.

Claim 8. The robotic package unloading system as described in claim 1, wherein said computer is used to process an algorithm to interpret the image sensor data and determine the location of packages for unloading.

Claim 9. The robotic package unloading system as described in claim 8, wherein the computer provides the robot manipulator with position and path data so that the robot manipulator grips the package with a variety of preprogrammed strategies.

Claim 10. A method of unloading uniform as well as non-uniform and non-structured bulk packages from a container, comprising the steps of:

- holding a package in a container;
- gripping said package with a robotic manipulator having an end-of-arm tool;
- moving said package with a short takeaway conveyor belt;
- connecting said carriage with said takeaway belt;
- identifying and locating said package in said container with an image sensor; and
- controlling and processing said robotic manipulator, said lift mechanism and said image sensor with a computer.

Claim 11. The method of unloading as described in claim 10, further comprising after the step of gripping the steps of:

- mounting said robotic manipulator in a carriage frame so that the robotic manipulator can move up and down; and
- lifting said carriage to position said carriage at a correct height for unloading said package with a lift mechanism.

Claim 12. The method of unloading as described in claim 10, wherein said package is pulled outwards until the package makes contact with the takeaway conveying belt, and once the package makes contact with the takeaway belt, the robot manipulator releases the package and let the package be carried away to the articulating belt, which in turn carries the package to the fixed takeaway conveyor.

Claim 13. The method of unloading as described in claim 11, further comprising a step of lowering said carriage after completing unloading all packages on a single layer until new packages are sensed by said image sensor.

Claim 14. The method of unloading as described in claim 13, further comprising a step of repeating said steps until all layers of the container are unloaded and the container is empty.

Claim 15. The method of unloading as described in claim 13, further comprising a step of positioning a new container by an operator into positioning for automatic unloading system.